

### In the Claims

1. (Cancelled).
2. (Cancelled).
3. (Cancelled).
4. (Cancelled).
5. (Cancelled).
6. (Cancelled).
7. (Cancelled).
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11. (Cancelled).
12. (Cancelled).
13. (Cancelled).
14. (Cancelled).
15. (Cancelled).
16. (Cancelled).
17. (Currently Amended) A method of communication using Orthogonal Frequency Division Multiplexing ('OFDM') from a transmitter comprising a plurality of transmit antenna means and a receiver comprising at least one receive antenna means, the method comprising:
  - generating bit streams and corresponding sets of  $N$  frequency domain carrier amplitudes ( $\tilde{s}(kN+j)$ ,  $0 \leq j \leq N-1$ ) modulated as OFDM symbols subsequently to be transmitted from a transmitter, where  $k$  is the OFDM symbol number and  $j$  indicates the corresponding OFDM carrier number;
  - inserting affix information into guard intervals between consecutive time domain OFDM symbols;
  - transmitting said time domain OFDM symbols including said affix information from said transmitter to said receiver;
  - using said affix information at the receiver to estimate the Channel Impulse Responses ( $\mathbf{H}_{lm}$  between the  $l$ th transmit and  $m$ th receive antenna) of the transmission channels between said transmitter and said receiver; and
  - using the estimated Channel Impulse Response ( $\hat{\mathbf{H}}_{lm}$  between the  $l$ th transmit and  $m$ th receive antenna) to demodulate said bit streams in the signals received at said receiver, wherein said affix information is known to said receiver as well as to said transmitter, and is mathematically equivalent to a vector ( $\mathbf{c}_D$ ) that is common to said time domain OFDM symbols multiplied

by at least first weighting factors ( $\alpha_k$ ) that are different for one time domain OFDM symbol ( $k$ ) than for another and second weighting factors ( $w_i(k)$ ) that enable one of said transmit antenna means ( $i$ ) to be distinguished from another;

wherein said transmitter uses  $N_t$  transmit antenna means and the receiver uses  $N_r$  receive antenna means,  $M'$  consecutive time domain OFDM data symbols are encoded by a specific space-time encoder  $\mathcal{M}$  such that the encoder  $\mathcal{M}$  produces  $M$  time domain OFDM data signals outputs for each of the  $N_t$  transmit antenna means, and said vector ( $\mathbf{c}_D$ ) is encoded by a specific space-time encoder  $\mathcal{W}$  such that the encoder  $\mathcal{W}$  produces  $M$  affixes for each of the  $N_t$  transmit antenna means corresponding to said affix information weighted by said first and second weighting factors ( $\alpha_k$ ) and  $w_i(k)$ , the resulting affixes being inserted between time domain OFDM data symbols for each of the  $N_t$  transmit antenna means.

18. (Currently Amended) A method of communication as claimed in claim 17 07, wherein said first weighting factors ( $\alpha_k$ ) have pseudo-random values.
19. (Currently Amended) A method of communication as claimed in claim 17 07, wherein said first weighting factors ( $\alpha_k$ ) have complex values.
20. (Currently Amended) A method of communication as claimed in claim 17 07, wherein said first weighting factors ( $\alpha_k$ ) are deterministic and are known to said receiver as well as to said transmitter independently of current communication between said receiver and said transmitter.
21. (Currently Amended) A method of communication as claimed in claim 17 07, wherein said first weighting factors ( $\alpha_k$ ) are communicated from said transmitter to said receiver.
22. (Cancelled)
23. (Currently Amended) A method of communication as claimed in claim 17 22, wherein the matrix of said second weighting factors ( $w_i(k)$ ) for said transmit antenna means and for a number  $N_T$  of consecutive symbols equal to the number  $N_T$  of said transmit antenna means is a non-orthogonal matrix ( $\mathbf{W}$ ) such that when multiplied by its complex conjugate transpose  $((\mathbf{W})^T)^*$  the

result is different from the identity matrix ( $\mathbf{I}$ ), weighted by a gain factor  $g_0$  having a non-zero real value (i.e.  $g_0\mathbf{I} \neq \mathbf{W}^H\mathbf{W}$ ).

24. (Currently Amended) A method of communication as claimed in claim 17 22, wherein all transmit antenna outputs over  $M$  consecutive OFDM time domain symbols, including time domain OFDM data symbols space-time encoded by  $\mathcal{M}$  and pseudo-random affixes space-time encoded by  $\mathcal{W}$ , are grouped into a **block S**, for which said first weighting factors ( $\alpha_k$ ) are the same for OFDM symbols of the same **block S** but are different for OFDM symbols of different **block S**.
25. (Previously Presented) A method of communication as claimed in claim 24, wherein said transmitted affixes enable the separation at said receiver of the transmitted guard interval affix information of said **block S**, and said second weighting factors ( $w_i(k)$ ) enable the separation and estimation at said receiver of the different physical channels between said transmit antenna means and said at least one receive antenna means.
26. (Previously Presented) A method of communication as claimed in claim 25, wherein demodulating said bit streams includes, for each said receive antenna means, multiplying a signal derived from the received signal  $\mathbf{d}_m$  by the complex conjugate transpose of the Kronecker product of said matrix of said second weighting factors ( $w_i(k)$ ) for said transmit antenna means by the identity matrix  $((\mathbf{W} \times \mathbf{I}_D)^H)$  and using channel estimates derived from the results in demodulating said bit streams.
27. (Previously Presented) A method of communication as claimed in claim 26, wherein the matrix of said second weighting factors ( $w_i(k)$ ) for said transmit antenna means and for a number  $N_t$  of consecutive symbols equal to the number  $N_t$  of said transmit antenna means is a matrix ( $\mathbf{W}$ ) such that ( $\mathbf{W}$ ) alone is non-orthogonal, but ( $\mathbf{W}$ ) combined with the corresponding pseudo-random factors ( $\alpha_k$ ) is orthogonal.
28. (Currently Amended) A method of claim 17 22, wherein the matrix  $\mathbf{W}$  corresponding to  $M \times N_t$  of said second weighting factors ( $w_i(k)$ ) for a number  $M$  of consecutive symbols and for said  $N_t$  transmit antenna means is an orthogonal matrix such that when multiplied by its complex conjugate

transpose  $((\mathbf{W})^T)^*$  the result is the identity matrix ( $\mathbf{I}$ ), weighted by a gain factor  $g_0$  having a non-zero real value (i.e.  $g_0 \mathbf{I} = \mathbf{W}^H \mathbf{W}$ ).

29. (Previously Presented) A method of claim 17, wherein said second weighting factors ( $w_i(k)$ ) take different values for each of said transmit antenna means so as to enable said physical channels to be distinguished.

30. (Previously Presented) A method of claim 17, wherein estimating the Channel Impulse Response ( $\mathbf{H}_{lm}$ ) of the transmission channels between said transmitter and said receiver comprises a step of making a moving average estimation over a plurality of symbol periods of channels which are mathematically equivalent to the relationship:

$$\mathbf{h}_{lm}^D(n) = \sum_{k=0}^n J_0(2\pi f_D k \Delta T) \tilde{\mathbf{h}}_{lm}^D(n-k)$$

where  $J_0(\cdot)$  is the 0th order Bessel function,  $f_D$  is the Doppler frequency,  $\Delta T$  is the MTMR PRP-OFDM block duration and  $\tilde{\mathbf{h}}_{lm}^D(n)$  is zero-mean complex Gaussian of constant variance.

31. (Cancelled)

32. (Cancelled)